



# California Morbidity

## Lyme Borreliosis - Update 1997

Lyme borreliosis (LB), or Lyme disease, was first identified in the late 1970s in the northeastern United States as an apparent cluster of juvenile rheumatoid arthritis. Today, LB is known to be caused by a tick-transmitted spirochete, *Borrelia burgdorferi*, and to encompass a spectrum of protean manifestations which may involve the musculoskeletal, cardiovascular, dermatologic, and peripheral and central nervous systems. Principal among the clinical manifestations is an expanding non-pruritic erythema migrans rash that appears in 60-70% of LB patients 3-30 days (average 5-10 days) after tick bite (1).

Nationwide reporting of LB was initiated in 1989 and, in subsequent years, LB has eclipsed Rocky Mountain spotted fever as the most frequently reported vector-borne disease in the United States. The annual number of LB cases reported nationwide has steadily increased to a provisional record total of 16,197 cases in 1996. Most LB cases continue to be reported from the northeastern and upper-Midwestern states. In contrast to the national trend, reported case totals for California have steadily declined over the last several years, from a high of 345 in 1990 to a provisional total of 64 cases in 1996. This phenomenon may represent a decrease in reporting efficiency (lower proportion of diagnosed cases being reported), diagnosis (fewer persons being diagnosed as having LB), or true incidence (fewer persons becoming infected). In addition, because annual LB case totals represent both incident and prevalent cases, the extant number of unreported prevalent cases might be expected to decrease with successive years, leading to an annual case total more closely approximating the concurrent incidence.

Until recently, diagnosis of LB by serological methods has suffered due to nonstandardized and nonspecific tests. Current recommendations for serodiagnosis are a two-step testing procedure using a *B. burgdorferi* flagellar protein-based enzyme immunoassay (EIA), followed by IgM and IgG Western immunoblotting of all EIA-positive and equivocal specimens (2). While this protocol has demonstrated excellent accuracy and precision (3), an understanding of the immunodynamics of LB is necessary to appropriately utilize and interpret serologic tests. In general, IgM titers are detectable ~2 weeks after infection, peak at 3-6 weeks, and rapidly abate; IgG titers lag IgM by 3-4 weeks, peak at 6-8 weeks or later, and persist for three years or more (4). Thus, LB patients may be seronegative if tested within the first 1-2 weeks after infection. Some reports have suggested that antibiotic treatment during this same period (e.g., early EM) may blunt the humoral response (5). Beyond 30 days post-infection, IgM results are generally regarded as uninterpretable and only IgG Western blots should be performed.

The only means of confirming LB is by culture and isolation of *Borrelia burgdorferi* from tissues of a suspect patient. While attempts to culture blood, CSF, or joint fluid are generally unrewarding, punch biopsy of an erythema migrans margin can yield *B. burgdorferi* organisms in up to 90% of cases (6). Unfortunately, the expense and limited availability of the special culture media (modified Barbour-Stoner-Kelly), and the slow generation time of the spirochetes, have limited the use and usefulness of biopsy culture as a tool for confirming LB. Nevertheless, culture confirmation of LB cases throughout California could provide important information toward enhancing our understanding of the epidemiology of LB and geographic distribution of exposure risk.

Lyme borreliosis is readily treated with oral or intravenous antibiotics. For patients with no neurologic manifestations, a 3-4 week regimen of amoxicillin (250-500 mg. po. tid) or doxycycline (100 mg. po. bid) is sufficient to clear the infection. Patients with central or peripheral neurologic involvement should receive 3-4 weeks of a third-generation cephalosporin (e.g., ceftriaxone 2g/day or 1g bid). Persistence of symptoms beyond the final day of therapy is relatively common and is rarely an indication for continued antibiotic treatment.

The vector for LB in California is the western black-legged tick, *Ixodes pacificus*. Survey efforts have identified this tick species in 55 of 58 counties in the State. In contrast to the northeastern U.S. where *B. burgdorferi* infection of the vector tick *I. scapularis* ranges between 25% to 50% or more (7), prevalence of infection in *I. pacificus* in California rarely exceeds 1-2%. One explanation for this difference is the unique

maintenance cycle of *B. burgdorferi* in California that involves the dusky-footed woodrat (*Neotoma fuscipes*) and the rodent tick species, *Ixodes neotomae*, which does not feed on humans (8). *Ixodes pacificus* become infected when immature ticks incidentally feed on infected woodrats. In addition, *I. pacificus* frequently feed on lizards which are incompetent hosts for the spirochete and thus serve as a mechanism of zoonophylaxis by decreasing the percentage of infected ticks. Although LB may be contracted in California throughout the year, more than 50% of cases occur during the late spring and early summer when immature *I. pacificus* are most active; in contrast, adult *I. pacificus* are most active during the late fall and winter months.

Personal protective measures are the best means of preventing LB. Because vector tick populations can be highly focal, identification and avoidance of areas with dense tick populations is the best means of avoiding infection. These include areas of tall, dense grasses, often bordering trails, for adult ticks, and areas of thick, cool leaf litter for nymphs. If trafficking in high-density tick areas is unavoidable, precautions such as wearing light-colored pants and a long-sleeved shirt, tucking pant legs into socks, and applying licensed tick repellents to clothes and skin are advised. Because at least 36-48 hours of attachment are required before ticks can effectively transmit the spirochete (9), daily self-examinations of skin, including the scalp and other haired areas, and prompt removal of all ticks are effective means of avoiding infection. Two pharmaceutical companies are currently in the latter stages of large-scale field trials for *B. burgdorferi* vaccines; at this point it remains undetermined if and when these products will be licensed and marketed.

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